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(54) Mechanical lock assembly for a driver side inflator.

(57) Airbag inflator module assembly (10) including a module housing (14) with a circular aperture having radially extending slots (38) and an inflator (12) with tapered flanges (26) which engage the housing slots (38) upon rotation of the inflator with respect to the housing to clamp an aperture bounding portion of the housing (14) between a radially extending flange of the inflator and the flanges (26). A recess engaging bump may be provided on the flange (26) or the housing (14) to resist counter-rotation of the inflator. The bump may alternatively engage a trailing edge of the flange. A separate bracket may provide rotational engagement with the housing in place of flanges formed integrally with the inflator.

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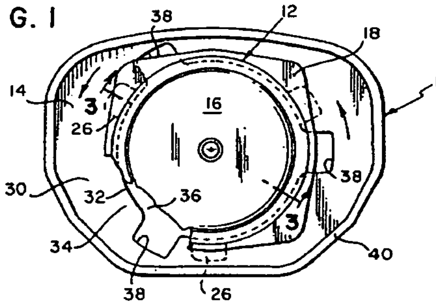

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This invention relates generally to inflatable-type modular occupant restraint systems for passenger vehicles or, as they are more commonly known, air bag restraint systems. More particularly, this invention relates to an improved means for quickly securing a driver side inflator to an air bag module.

An air bag restraint system typically includes a canister, which has an open side and encloses an inflator and at least part of an air bag, and a cover which conceals the module from view. A driver side air bag module is typically mounted in the center of the steering wheel behind a protective cover. When the air bag module is designed for the passenger side of a vehicle, the container may be located just behind the vehicle dashboard, cosmetic cover, or passenger side instrument panel (hereinafter referred to as "dashboard") and the cover may form an integral part of the vehicle dashboard.

When the vehicle is involved in a collision, a crash signal initiates operation of the inflator to cause the air bag to deploy. The inflator produces an inert gas (e.g., nitrogen) which is directed under pressure into the air bag to force the air bag out of the canister incorporated in the module and into the passenger compartment of the vehicle. As the air bag is forced out of the module the pressure exerted on the driver side cover or dashboard causes selected portions of the cover or dashboard to separate, in a predetermined manner along tear seams or breakaway seams (hereinafter referred to as "tear seams") to enable the air bag to be directed into the passenger compartment.

In the conventional mounting of a driver side air bag inflator to a module housing, the air bag cushion is attached to one side of a module housing with a retainer ring. The air bag inflator is attached to the opposite side of the module housing from the air bag cushion with bolts secured with nuts. The installation of the inflator in an air bag module requires a number of fastening steps and machine steps to secure the inflator, which installation step increases the cycle time for the manufacture of a module. Further, the use of fasteners to attach the inflator to an air bag module is a major cause of reworking of the inflator module assembly due to the necessity of replacing broken or unsecured fasteners. Reworking of the inflator module is not always possible. In these situations the defective modules must be discarded, resulting in lost production and increased manufacturing costs. The elimination of fasteners in the manufacture of the air bag module assembly would eliminate a major cause for reworking and disposal of defective inflator modules. Further, a simplified attachment system which would permit easy removal of the inflator without the need for special tools would reduce the cost and time associated with reworking of the module should removal become necessary.

It is an object of this invention to overcome one or more of the problems noted hereinabove. These and other objectives of the invention, which will become apparent from the following description, have been achieved by a novel device for securing an air bag inflator to a module housing. The two-part inflator for use with this invention has a base plate attached to a top section and a number of flanges attached to the outside edge of the inflator base section. The module housing has a mounting edge, a body, and an inflator-side edge which corresponds substantially to the outside edge of the inflator base section. A plurality of slots extend radially outward from the inflator-side edge with the slots open on the inflator-side edge. The inflator is placed onto the module housing and is rotated such that the flanges pass through the slots of the module housing and the flanges engage with the module housing thereby clamping the module housing between the base plate and the flanges of the inflator. The leading edge of the flange may be beveled or angled so as to more easily move against the module housing. A bump or raised portion may be formed in the module housing to prevent the flange and thereby the inflator from rotating backward and becoming disengaged from the module housing. Alternatively, a bump or raised section can be formed on the flange with a corresponding depression in the module housing to lock the inflator in place once rotated into position.

In a second embodiment of this invention, a number of flanges are attached to the top section of the inflator near the bottom edge. A number of cuts are made radially outward of the inflator-side edge of the module housing and the body of the module housing adjacent to the cut is bent away from the plane of the module housing body in order to form cups or pockets into which the flanges of the inflator may be moved. When the inflator is placed onto the module housing and rotated the flanges engage with the pockets, thereby holding the inflator in place. The pocket may have a bump or raised portion which will engage with the flange to prevent it from moving out of position.

In another embodiment of this invention, an L-shaped tab may be attached to or formed from the body of the module housing. A flange, attached to a mounting bracket, which is inserted over the inflator and which secures the inflator, can be rotated in such a manner that the flange on the bracket engages with the L-shaped tab to hold the inflator onto the module housing. In a similar manner an L-shaped tab attached to the edge of the mounting bracket can engage with corresponding slots or apertures formed in the module housing.

With this description of the invention, a detailed description follows with reference being made to the accompanying figures of drawings which form part of the specification related thereto, in which like parts are designated by the same reference numbers, and of which:

Fig. 1 is a fragmented bottom plan view of the first embodiment of this invention illustrating an inflator locked into position on a module housing;

Figs. 2a and 2b are side and top plan views illustrating the inflator of Fig. 1 (Note: Fig. 2a has been simplified to show only one extending flange);

Fig. 3 is a cross-sectional view taken along line 3-3 of Fig. 1 illustrating an inflator locked into position on a module housing;

Fig. 4 is a fragmented top plan view illustrating the second embodiment of this invention for securing an inflator to a module housing;

Fig. 5 is a top plan view of the inflator of Fig. 4;

Fig. 6a is a cross-sectional view taken along line 6-6 of Fig. 4 illustrating the flange engaged in the underside of a pocket formed into the module housing at the inflator side edge;

Fig. 6b is a cross-sectional view similar to that of Fig. 6a illustrating a tapered flange;

Fig. 7 is a top plan view of the third embodiment of the invention illustrating a bracket for holding the inflator onto the module housing;

Fig. 8 is a partial view illustrating the third embodiment of this invention; and

Fig. 9 is a partial view illustrating the fourth embodiment of this invention.

Referring to Figs. 1, 2a, 2b, and 3, a driver side inflator module (with air bag and cover removed) is shown generally at **10**. The driver side module **10** comprises a driver side inflator **12** attached to a module housing **14**. The inflator **12** is composed of a top section **16** with a base plate **18** formed radially outward from the top section side wall **20** adjacent to the bottom edge **22**, and a bottom section **24** with a number of flanges **26** attached thereto and extending radially outward from the bottom section side wall **28**. The module housing **14** has an inflator-side edge **32** formed generally in the center of the module housing body **34**, the inflator-side edge **32** defining an aperture **36** for receiving the bottom section **24** of the inflator **12**. A number of slots **38** formed in the module housing body **34** radially outward of the inflator-side edge **32** and continuous to the aperture **36**. A mounting edge **40** is formed into the module housing **14** for securing the steering wheel cover (not shown). The inflator bottom section **24** is inserted through aperture **36** so that flanges **26** pass through slots **38** in the module housing. The inflator **12** is then rotated thereby clamping the inflator-side edge **32** of the module housing **14** between the flanges **26** and the base plate **18** of top section **16**. To better lock the inflator **12** into position bumps **42** formed onto inflator flanges **26** engage with second apertures **44** formed in the module housing **14**.

In a second embodiment as shown in Figs. 4, 5, 6a and 6b, a number of second flanges **46** are attached to the inflator top section **16** adjacent to the bottom edge **22**. The module housing **14** adjacent the inflator-side edge **32** is bent out of the plane **48** of the module housing body **34** to form a pocket **50** having an opening **52** to permit flange **46** to be inserted. The leading edge **54** of second flanges **46** is moved into the pocket **50** when inflator **12** is rotated about its center axis **56**. A second bump **58** on the underside **60** of pocket **50** prevents the second flange **46** from moving backward after the trailing edge **62** of the flange **46** has moved past the second bump **58**. The flange **46** may be tapered as shown in Fig. 6b and the leading edge **54** may becurved **64** as shown in Fig. 5 to better engage with the front edge **66** of pocket **50**.

In a third embodiment, as shown in Figs. 7, 8 and 9 a tab **68** with an end section **70** at an angle from the base **72** of tab **68** may be formed in module housing **14**. A retention bracket **74** which is inserted over inflator **12** has a number of bracket flanges **76** attached thereto. The flanges **76** engage with the tab **68** when the retention bracket **74** is rotated into position. Alternately, a bracket tab **78**, as shown in Fig. 9, may be formed into the edge of the retention bracket **74**. The end section **80** of the bracket tab **78** engages with a second slot **82** in the module housing **14**. The module housing **14** can be formed from aluminum, regular carbon steel or heat treated steel. The retention bracket **74** can be formed from regular carbon steel or heat treated steel.

To install the inflator **12** of the first embodiment of this invention onto a module housing **14**, the inflator **12** is pressed into place and rotated to engage the flange **26** with the module housing body **34** thereby clamping the module housing **14** between the flanges **24** and base plate **18**. A similar procedure will lock the inflator **12** of the second embodiment onto the module housing **14**. Alternatively, a retention bracket **74** may be used as discussed under the third embodiment.

Thus, in accordance with the invention, there has been provided a quick and efficient locking mechanism for securing the inflator onto an air bag module housing without the need of fasteners or special tools.

Claims

1. An air bag inflator module (10) comprising:

an air bag inflator (12) having a first section (16) and a second section (24), each having a substantially circular cross section, with a base plate (18) and engagement means each extending radially outwardly from one of the sections said engagement means being tapered from a leading edge (54) to a trailing edge (62);

a module housing comprising a mounting edge (40), a body (14) defining a plane (48) with a top surface and a bottom surface, and an inflator-side edge (32) which corresponds substantially to the circular cross section of one of the in-

flator sections (16, 24), with at least one slot (38);
wherein said inflator (12) is engageable with said module housing body (14) by positioning one of said inflator sections adjacent said inflator-side edge (32) and rotating said engagement means so that it engages said at least one slot (38).

2. The assembly (10) claimed in claim 1 wherein said engagement means comprises at least one flange (26) extending radially outwardly from one of said sections (24), and said at least one slot (38) extends radially outwardly and continuously from said inflator-side edge (32) such that rotation of said inflator (12) causes said at least one flange (26) to pass through said at least one slot (38) and thereby engage said module housing body (14) whereby the module housing body adjacent said inflator-side edge (32) is held between said at least one flange (26) and said base plate (18).

3. The assembly (10) of claim 2 wherein said air bag inflator (12) comprises a plurality of flanges (26) extending radially outwardly from one inflator section (24) and said module housing body (14) comprises a plurality of slots (38) extending radially outwardly and continuously from the inflator-side edge (32) and wherein when said inflator (12) is placed on said module housing body (14) and rotated, each one of the plurality of flanges (26) is passed through a corresponding one of the plurality of slots (38).

4. The assembly (10) of any one of claims 1 to 3 further comprising a bump (42) and depression (44) each formed on one of the bottom of said module housing body (14) adjacent to at least one slot (38) and on the inflator engagement means (26, 46), the bump (42) engaging with the depression (44) to lock the inflator (12) in position when said inflator is placed on said module housing body (14) and rotated.

5. The assembly (10) of any one of claims 1 to 3 wherein a bump (58) is formed on the bottom surface of said module housing body (14) in close proximity to the at least one slot and wherein after the engagement means (46) passes the bump (58), its trailing edge (62) engages with said bump (58) thereby stopping the counter rotation of said inflator (12).

6. The assembly (10) of any preceding claim wherein said at least one slot is formed by said module housing body (14) adjacent said at least one slot being bent away from the plane (48) of the module housing body (14) to form a pocket (50) open to the inflator-side edge (32).

7. The assembly claimed in claim 1 wherein said engagement means includes a bracket (74) having an inner aperture which corresponds substantially to the circular cross section of one of the air bag inflator sections (16), wherein said one air bag inflator section (16) is inserted through the bracket aperture and said bracket (74) is placed in contact with the air bag inflator base plate (18) prior to rotation of said bracket (74) to effect engagement of said bracket (74) with said module housing body (14).

8. The assembly (10) claimed in claim 7 wherein said bracket (74) includes a plurality of flanges (76) which upon bracket rotation pass under L-shaped tabs (70) and engage therewith to hold said inflator (12) between said bracket (74) and said module housing body (14).

9. The assembly (10) claimed in claim 7 wherein said bracket (74) includes a plurality of L-shaped tabs (78) extending outwardly from a bracket outer edge each of which passes through an aperture (82) in said module housing body (14) upon rotation of said bracket (74) to hold said inflator (12) between said bracket (74) and said module housing body (14).

FIG. 1

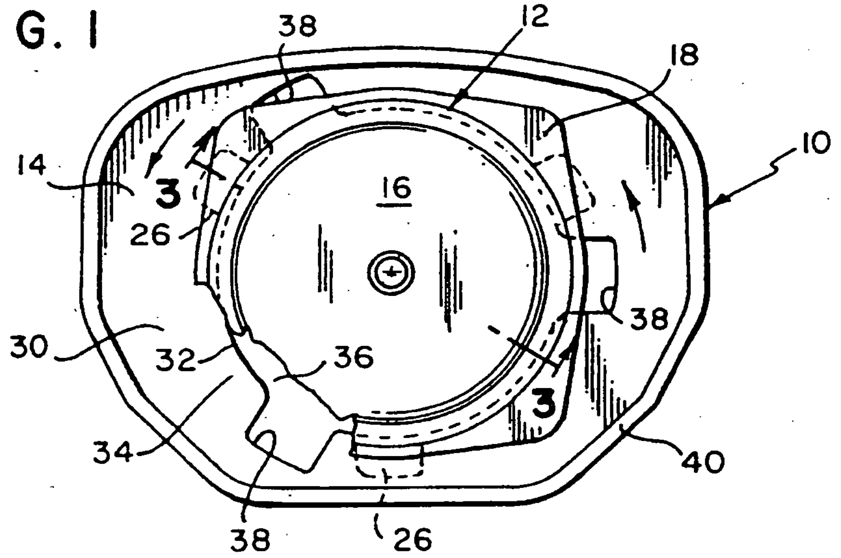


FIG. 2a

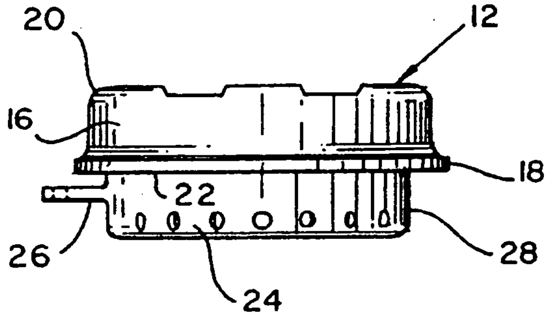
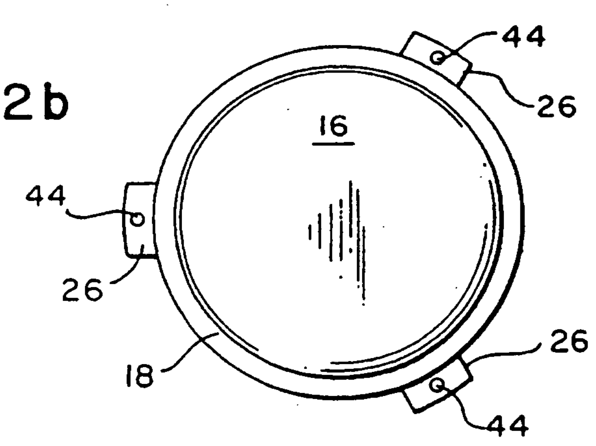


FIG. 2b



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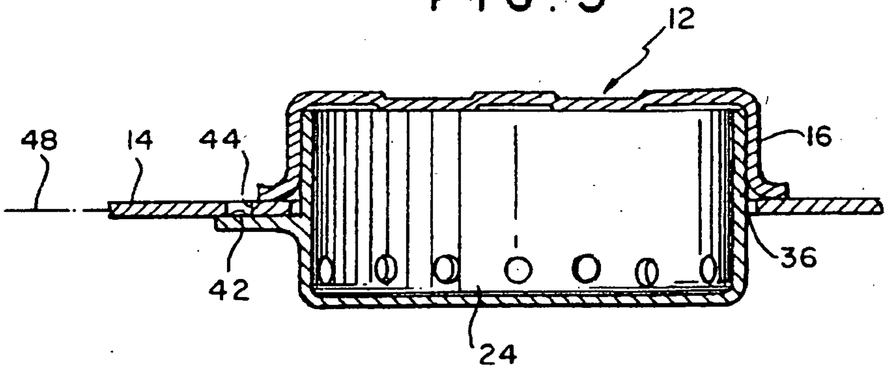

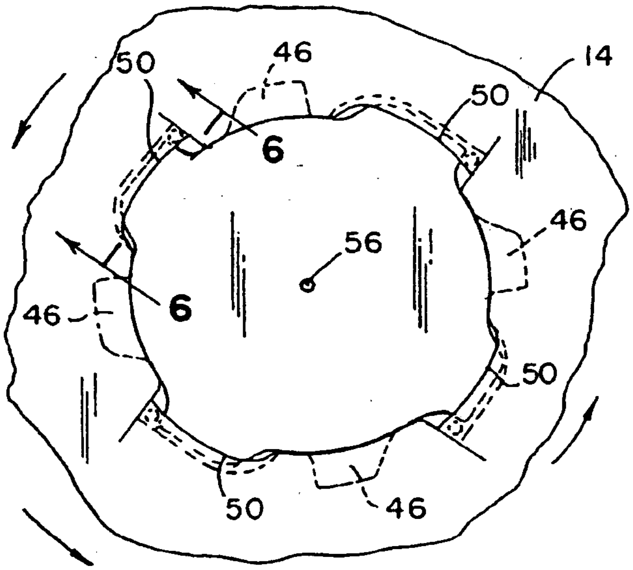

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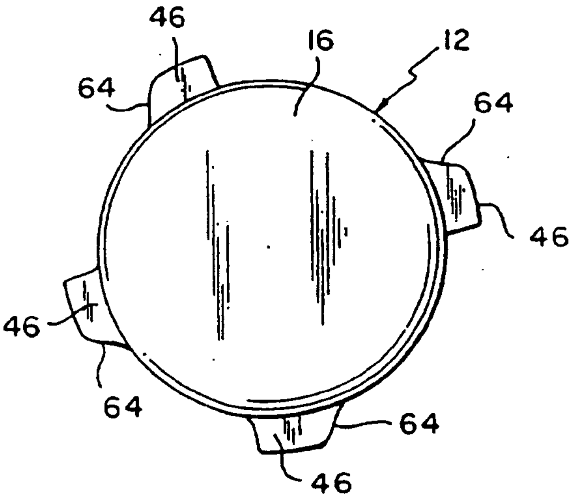

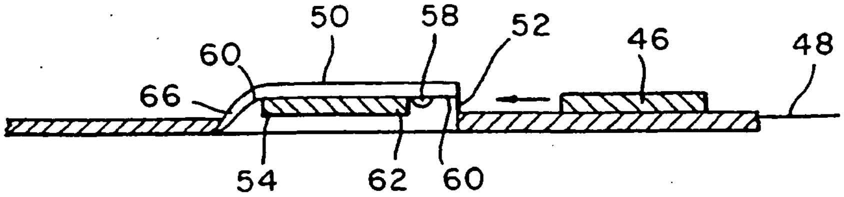

FIG. 6a

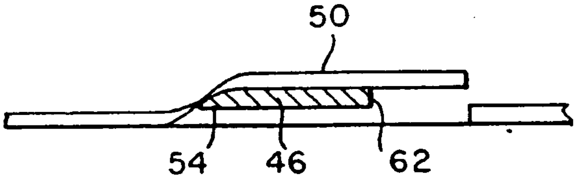

FIG. 6b

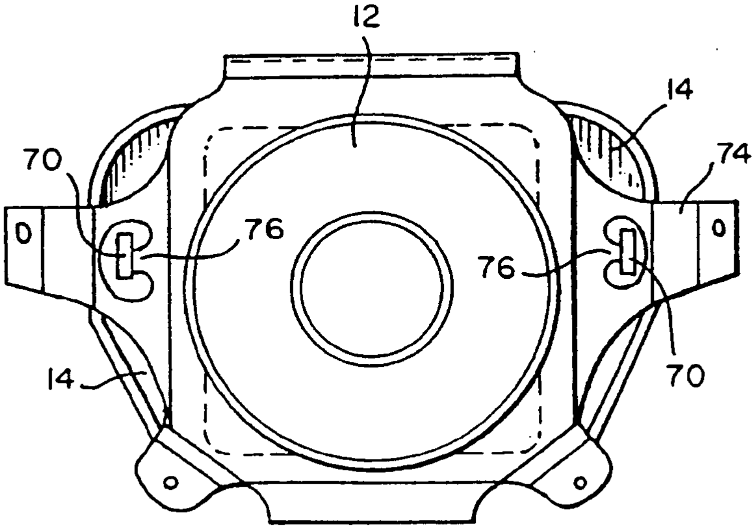

FIG. 7

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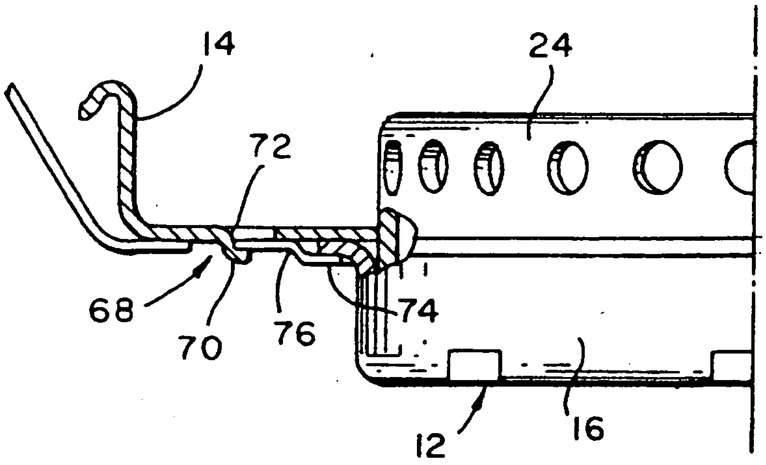

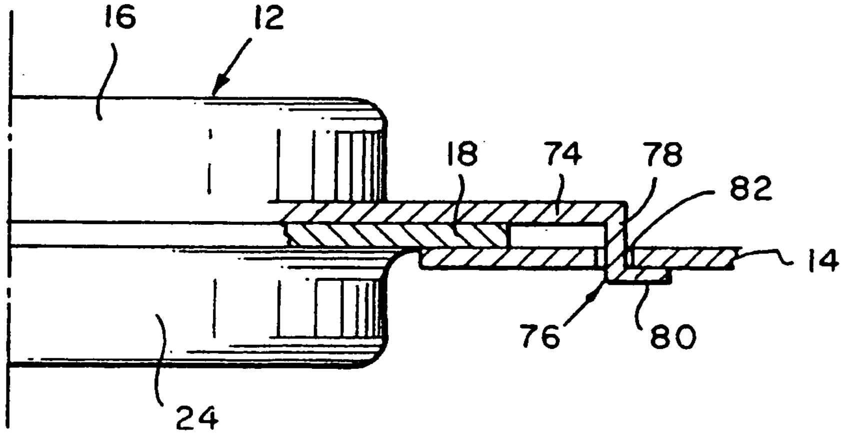

F I G. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 95301547.6

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
A	DE - A - 3 630 685 (TRW REPA) * Fig. 1, pos. 36 * --	1	B 60 R 21/26
A	US - A - 3 787 074 (LEWIS) * Fig. 1, pos. 7 * --	1	
A	US - A - 3 944 251 (LYNCH) * Fig. 1, pos. 29; fig. 2, pos. 46 * --	1	
A	US - A - 4 183 550 (SUDOV) * fig. 2, pos. 15,16 * ----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl. 6)

B 60 R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	03-05-1995	PANGRATZ

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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US 1069000502P1

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1	IDS	4

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